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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1964

LAKEVIEW

water pollution control plant

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1964
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DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Lakeview Local Advisory Committee,
The Township of Toronto and the Municipality of
Metropolitan Toronto.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Lakeview Water Pollution Control Plant, OWRC Project No. 59-S-43.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly, P. Eng.,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Lakeview Water Pollution Control Plant, OWRC Project No. 59-S-43 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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LAKEVIEW

water pollution control plant

operated for

THE TOWNSHIP OF TORONTO

and

THE MUNICIPALITY OF METROPOLITAN TORONTO

by

THE ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

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Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street — Toronto 5

'64 REVIEW

This report has given in detail the significant data on the operation of the various treatment units at the Lakeview Water Pollution Control Plant.

The final effluent quality did not meet OWRC objectives of 15 ppm BOD and 15 ppm SS due mainly to the flow conditions experienced.

The average daily flow for the last 10 months of 1964 was 6.5 mgd. This is an increase of 90% over 1963 when the average flow was 3.4 mgd. However, the sustained daily 12 hour maximum flow was frequently in excess of the 8.0 mgd rate during the latter part of 1964.

Sludge haulage costs were cut substantially in 1964. This was accomplished by the installation of a sludge supernatant line laid from the digesters to the aeration sections. Although the supernatant had a high solids content, it had no adverse effect on the process.

Experimental sludge lagoons were built in the fall of 1964 and early results are promising.

Numerous pieces of equipment were purchased during the year for use by the plant maintenance staff. This policy will be continued and it is expected that when the plant is enlarged it will be self supporting. Apart from the high flows, the plant had a successful year of operation.

Sampling of industrial wastes in 1963 gave no conclusive results and the practice was discontinued in 1964.

Nitrogen variation studies were continued in 1964. The only conclusion which can be drawn is that there is no breakdown in the free ammonia. This is an indication of incomplete treatment, mainly due to the high hydraulic loadings experienced in 1964.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 - 1964

In 1956, the Township of Toronto and the Ontario Water Resources Commission initiated plans for the construction of a modern water pollution control plant. The firm of Gore and Storrie, Toronto Ontario, was engaged to prepare plans and specifications for the project.

In April 1957, Metropolitan Toronto expressed interest in sharing the cost with the Township of Toronto in the construction of a joint water pollution control plant, the costs to be shared 70 percent by Metropolitan Toronto and 30 percent by the Township of Toronto.

APPROVAL

On June 6, 1960, the municipalities signed an agreement with the Ontario Water Resources Commission to finance, construct, and operate a water pollution control plant.

CONSTRUCTION

Schwenger Construction Co. Ltd. - Burlington, Ontario was awarded the contract and the project was officially opened on November 24, 1961.

TOTAL COST

The total cost of the project was $1,883,644.00.



Project Staff

K. Stratton
Plant Superintendent

Mr. K. Stratton, Plant Superintendent, joined the Commission in May 1958 as an operator at the Stratford Water Pollution Control Plant. He later became Chief Operator and in October 1961 was transferred to the Toronto-Lakeview plant and promoted to Plant Superintendent.

Other members of the Toronto-Lakeview staff and their starting dates are:

F. Mines, Plant Mechanic	November 1961
A. Srebotnjak, Operator	November 1961
S. McKnight, Operator	November 1961
F. A. Press, Groundskeeper and Janitor	November 1961
N. Cation, Operator	July 1963
M. H. Godfrey	September 1964



Description of Project

INFLUENT WORKS

The waste water enters the plant through a 48 inch diameter sewer, passing into the influent chamber. The chamber is equipped with a bar screen to remove large objects from the sewage. The flow then discharges to the aerated grit chamber where the velocity of flow is reduced sufficiently to allow grit and detritus material, which may damage plant machinery, to settle out. The air introduced in the chamber produces a roll which allows grit to settle out, while keeping the organic material in suspension. A clam shell bucket hoist removes the settled grit.

From the grit chamber, the flow passes through a comminuting device which screens and shreds the larger particles to a size suitable for handling in the treatment units. From this point, the flow is discharged to the primary tanks.

PRIMARY SEDIMENTATION

The two rectangular tanks are designed to provide an adequate detention period to allow the heavier solids to settle out, and for removal of surface scum and grease.

The tanks are divided into two sections and equipped with longitudinal sludge collectors which serve as skimming mechanisms for removal of surface material and for transferring the settled sludge to hoppers located at the end of the tanks. The sludge hoppers are equipped with cross collector mechanisms which draw the sludge to a central

point. The sludge and the surface material is drawn off and pumped to the primary digester.

The primary tanks are designed to provide a detention period, sufficient to allow removal of approximately 30-35% of the heavy organic material.

The settled waste water flows over the effluent weirs and discharges into the aeration tanks.

AERATION

The flow upon entering these two, three pass, aeration tanks undergoes another detention period which provides the biological environment required to remove the finely divided, suspended and dissolved organic materials remaining in the flow.

The settled sludge (activated sludge), from the final settling tanks, is recirculated back to the aeration tanks, and mixes with the incoming effluent from the primary tanks. This mixed liquid is then aerated by air, which is supplied from compressors. The air supplied provides the oxygen requirements of the biological communities of aerobic micro-organisms (mixed liquor sludge floc) and also produces a roll which prevents settling in the tanks. The activated sludge which is returned acts as the vehicle for the bacteria which in turn oxidizes the organic material contained in the sewage.

The mixed liquor then passes into the final settling tanks where the activated sludge is settled out.

FINAL SEDIMENTATION

The three rectangular final sedimentation tanks provide a detention period to allow remaining activated sludge solids to settle out. It is the activated sludge, settling out in these tanks, that is returned to the aeration tanks to provide the continuous environment for the maintenance of the floc in the aeration section.

The final sedimentation tanks are equipped with two longitudinal sludge collectors which transfer the settled sludge to the hopper located at the end of the tank. Cross collectors transfer the sludge from the hopper to a central point from where pumps transfer it back to the aeration tanks or to waste. After final settling, the effluent flows through a Parshall flume which measures the flow leaving the plant and then to the chlorinating manhole.

DIGESTION

Sludge digestion in this plant is performed in two stages called primary and secondary digestion.

The sludge from the primary tanks is pumped, with excess activated sludge, to the primary digester. In the absence of air, and in a regulated temperature of 90 degrees Fahrenheit, the decomposing or digestion process begins. Constant agitation within the tank ensures overall treatment.

The raw sludge is broken down by anaerobic bacterial action and, when thoroughly digested, is a thick, black odourless liquid.

The secondary digester receives the digested material from the primary and completes the process. The secondary digester is not agitated, but is allowed to be quiescent. The supernatant is decanted and returned to the treatment process.

Sludge gas (principally methane), formed during the process, is used as a fuel for the heat exchangers and boiler, supplying heat to the digesters and buildings. The standby fuel is oil.

CHLORINATION

The chlorinator is capable of injecting up to 2,000 pounds per day of chlorine into the final effluent to reduce the bacteria count to acceptable limits.

PROJECT COSTS

TOTAL CAPITAL COST: $1,874.529.27

The total cost to the municipality during 1964 was as follows:

Net Operating		$ 159,677.53
Debt Retirement		
Toronto Twp.	9,752.00	
Metro Toronto	24,489.00	34,241.00
Reserve		
Toronto Twp.	3,293.00	
Metro Toronto	9,655.00	12,948.00
Interest Charged		
Toronto Twp.	15,350.24	
Metro Toronto	80,167.66	95,517.90
		$ 302,384.43

RESERVE ACCOUNT

Balance at January 1, 1964		
Toronto Twp.	7,480.84	
Metro Toronto	21,939.70	$ 29,419.54
Deposited by Municipality		12,948.00
Interest Earned		
Toronto Twp.	481.40	
Metro Toronto	1,412.92	1,894.32
		$ 44,261.86
Less Expenditures		-
Balance at December 31, 1964		$ 44,261.86

LONG TERM DEBT: The municipality's long term debt to the OWRC, revised December 31, 1964, was $1,697,877.42.

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	10951.12	1858.76	563.91	84.01	2831.57	7.53	75.64	39.82	81.16	5332.02	76.70
FEB	10812.96	2552.63	563.86	83.28	1091.39	1353.06	312.48	61.63	254.28	4519.65	20.70
MARCH	18619.10	2728.10	589.23		1151.30	5184.90	156.09	267.20	313.42	8189.71	39.15
APRIL	16582.81	3013.80	511.52		1183.41	5618.80	500.40	618.53	250.43	4828.23	57.69
MAY	9167.35	4069.24	875.74	136.28	1232.81	(3150.00)	169.65	1814.77	201.66	3720.71	96.49
JUNE	21769.20	2737,31	523.35		1517.01	4178.46	265.22	66.42	750.17	11728.56	2.70
JULY	20901.22	2581.99	934.73	89.88	1301.77	4274.45	298.56		167.63	11168.24	83.97
AUG	11614.52	2600.63	753.62	58.69	1298.27		130.51	(147.76)	260.35	6630.58	23.63
SEPT	6742.31	2196.99	552.75		1230.20	1689.24	682.49	110.07	48.56	183.36	48.65
OCT	16987.55	2499.12	767.77	64.26	1673.96		157.61	1.58	325.47	11447.05	50.73
NOV	12698.72	2053.09	822.13		1576.41	43.38	220.62	392.37	372.33	7144.22	74.17
DEC	2830.67	3566.01	1296.87		3224.31	(9859.46)	397.34	62.21	417.94	3596.38	129.07
TOTAL	159677.53	32457.67	8755.48	516.40	19312.41	9340.36	3372.61	3286.84	3443.40	78488.71	703.65

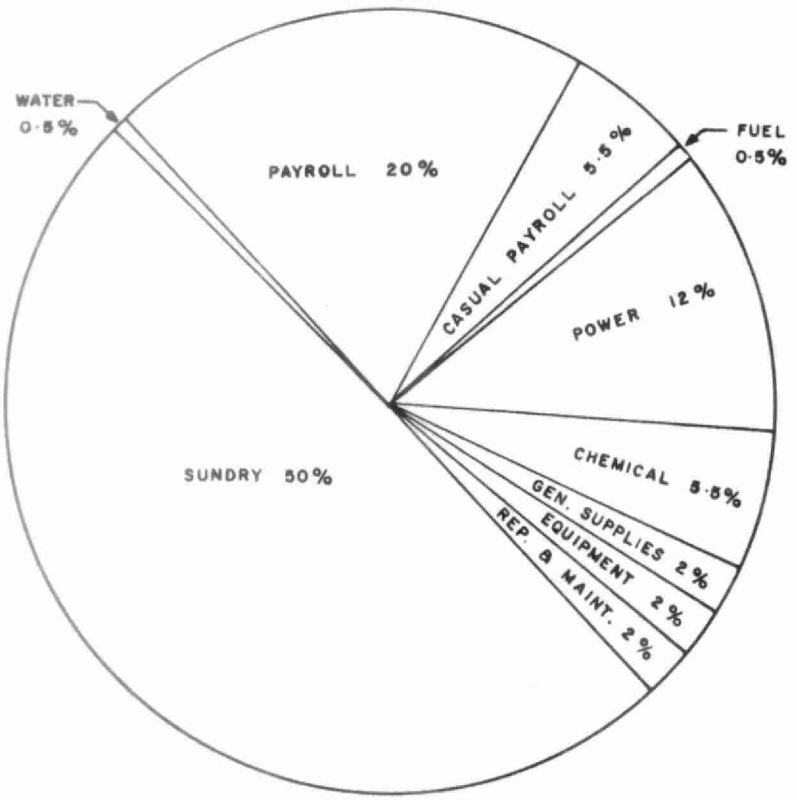
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $62,461.68

BRACKETS INDICATE CREDIT

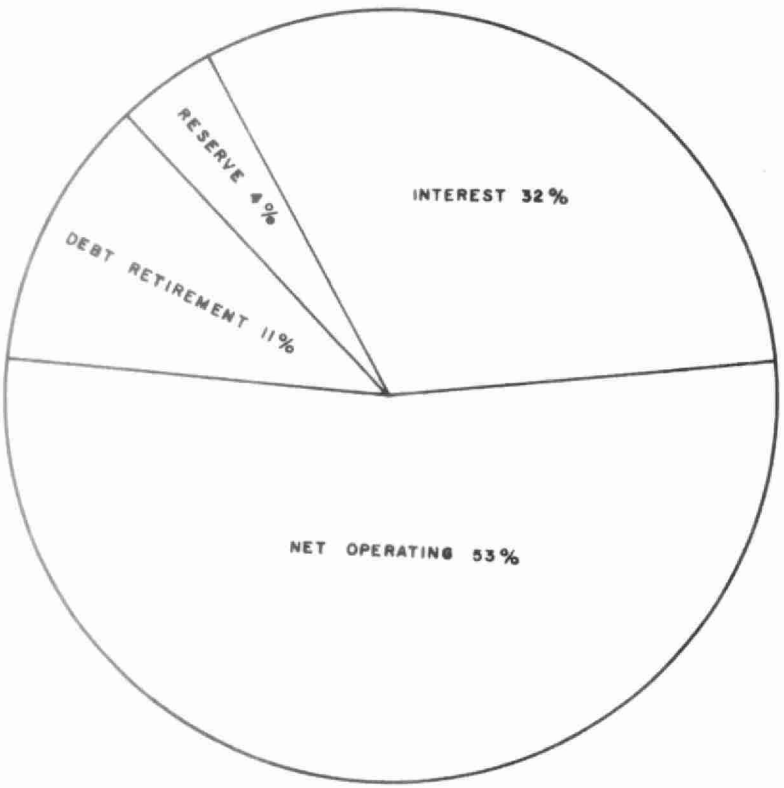
YEARLY COSTS

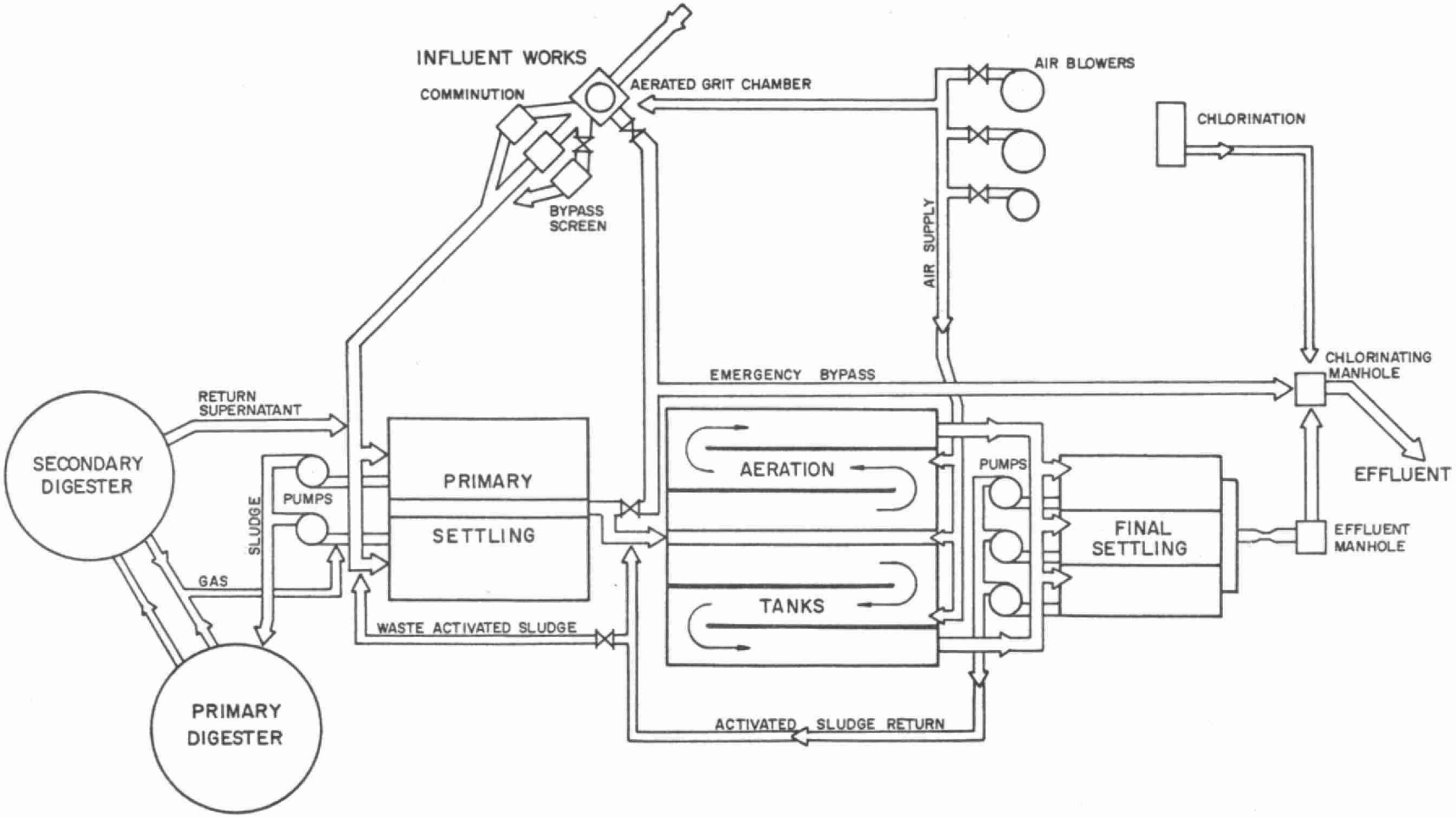
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1962	740.900	$73998.00		99.87	7 CENTS
1963	1209.400	118027.00		98.00	5 CENTS
1964	2358.700	159678.00		67.69	3 CENTS

1964 OPERATING COST



TOTAL ANNUAL COST





LAKEVIEW WPCP FLOW CHART

Design–Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 50,000 persons.

Design Plant Flow - 5 MGD.

Per Capita Flow - 100 gallons per day.

Five Day BOD -

Raw Sewage	-	225 PPM
Removal	-	90%

Suspended Solids -

Raw Sewage	-	250 PPM
Removal	-	90%

GRIT CHAMBER

14 ft. x 15 ft. 5 in. x 11 ft. deep, with a volume of 2,375 cubic feet, (14,800 gallons), and a design flow detention period of 4.26 minutes.

PRIMARY SEDIMENTATION TANKS

The two tanks, each 87 ft. x 32 ft. x 12 ft. deep, have a combined volume of 66,900 cubic feet, (417,000 gallons). Design detention is 2.0 hours. The surface settling rate is 900 gallons per square foot of tank per day, and the weir overflow rate is 13,000 gallons per lineal foot of weir per day. The longitudinal collector speed is 2.0 feet per minute and the cross collector 4.0 feet per minute.

AERATION

The two rectangular three pass tanks are each 144 ft. x 21 ft. x 14.3 ft. deep, with a combined volume of 250,000 cubic feet, (1,650,000 gallons). The aeration period at design flow is 7.9 hours, and with 25% return activated sludge is 6 hours. The air supply is 1.1 cubic feet per gallon.

FINAL SEDIMENTATION TANK

The three rectangular tanks are 87 ft. x 32 ft. x 12 ft. deep, with a combined volume of 100,000 cubic feet (624,000 gallons). The design detention period is 3 hours. The surface settling rate is 600 gallons per square foot of tank per day, and the weir overflow rate is 7,000 gallons per lineal foot of weir per day. The speed of the longitudinal collectors is 1.0 ft. per minute and the three cross collectors 2.0 ft. per minute.

CHLORINATION

The effluent sewer, approximately 2,000 feet long, acts as a chlorine contact chamber and provides a detention period of 50 minutes.

DIGESTION

Two tanks - concrete roofs - 65 feet in diameter with a combined volume of 164,500 cubic feet. Their capacity is 3.28 cubic feet per capita, and loading is 2.3 lbs. of solids per cubic foot of tank per month.

EQUIPMENT

The two large air blowers each have a rated capacity of 3,900 cubic feet of air per minute and the small blower, 1,700 cubic feet, operating against a gauge pressure of 6.5 psi, with an overall total capacity of 11,500,000 cubic feet of air per day.

Located in the raw sludge pumping station are two raw sludge pumps, 50 gpm at 70 ft. TDH each, and a scum pump, 80 gpm at 70 ft. TDH. Located in the return sludge pumping station are four activated sludge return pumps, 600 gpm each, and a scum pump 50 gpm. Located in the digester control building are two sludge transfer pumps, 150 gpm each, and two sludge recirculating pumps 120 gpm each.

Technical Section

PROCESS DATA

FLOW CHART

MONTH	METROPOLITAN TORONTO MG	TORONTO TOWNSHIP MG	PORT CREDIT MG	TOTAL PLANT MG
JANUARY	40.517	71.668	12.462	124.647
FEBRUARY	47.851	53.102	10.620	111.573
MARCH	88.600	72.820	15.610	177.030
APRIL	84.490	75.590	13.950	174.390
MAY	107.280	67.900	14.420	189.600
JUNE	123.470	62.520	14.670	200.660
JULY	103.630	66.680	16.610	186.920
AUGUST	166.260	78.040	17.070	261.370
SEPTEMBER	180.290	59.580	14.350	254.220
OCTOBER	138.560	71.500	12.920	222.980
NOVEMBER	137.300	73.130	10.990	221.420
DECEMBER	141.280	82.910	9.770	233.960
TOTAL	1359.528	835.800	163.442	2358.770
AVERAGE	113.294	69.650	13.620	196.564
PERCENT OF TOTAL YEARLY FLOW	57.64	35.43	6.93	100.0

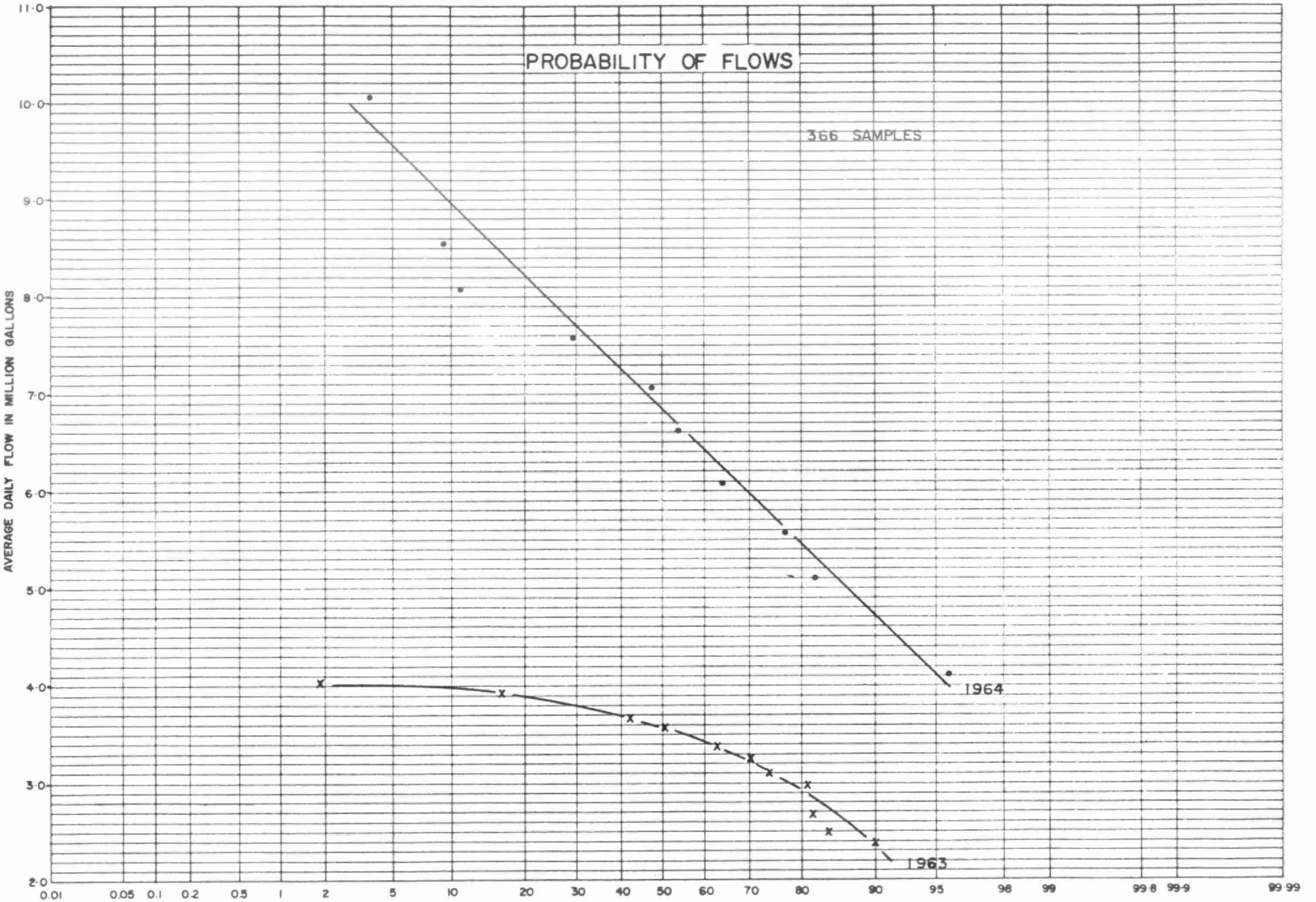
COMMENTS

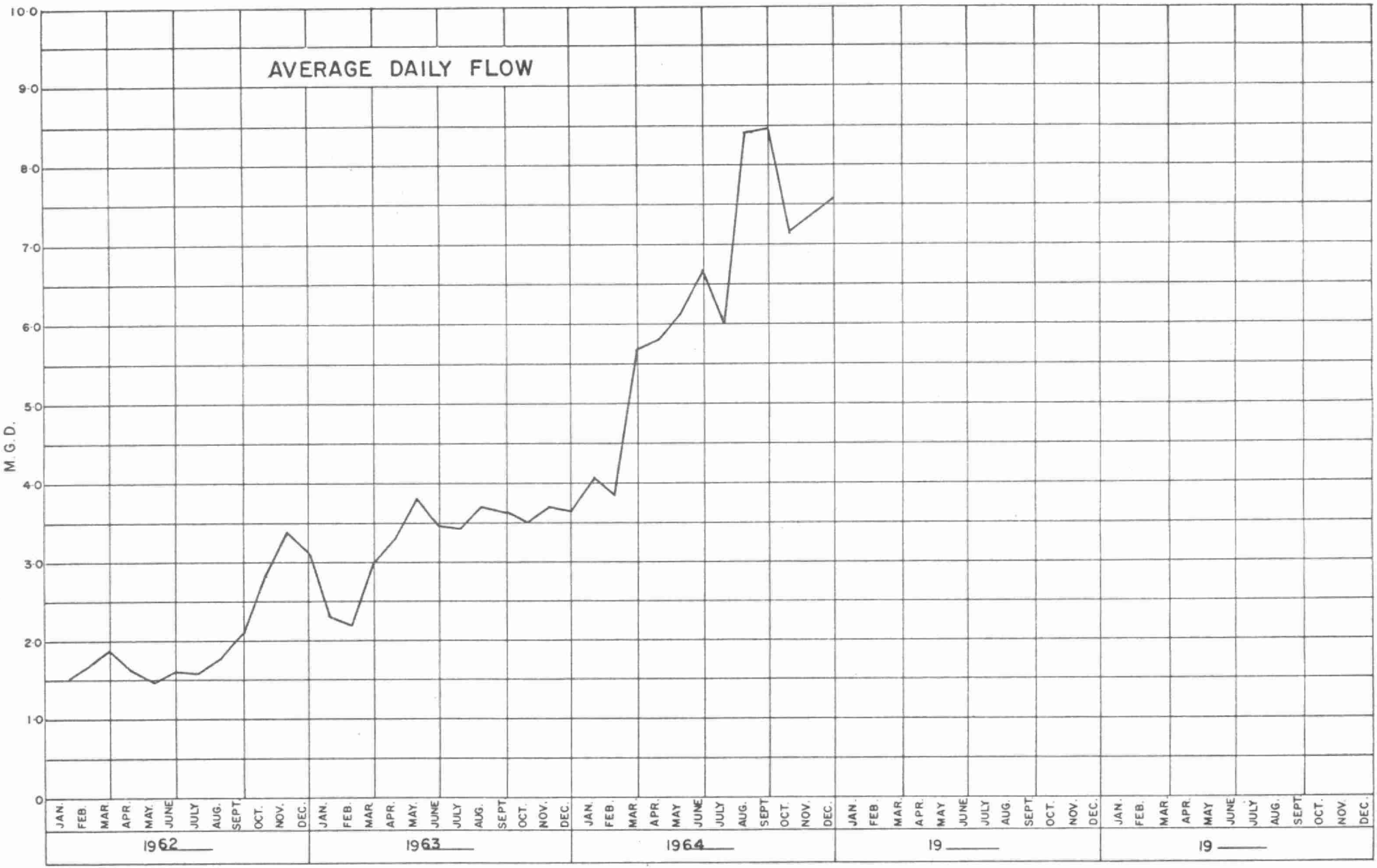
During 1964 a total of 2358.77 million gallons of sewage were treated at the Lakeview plant. This represents an average daily flow of 6.44 million gallons per day or 129 percent of the design capacity of the plant.

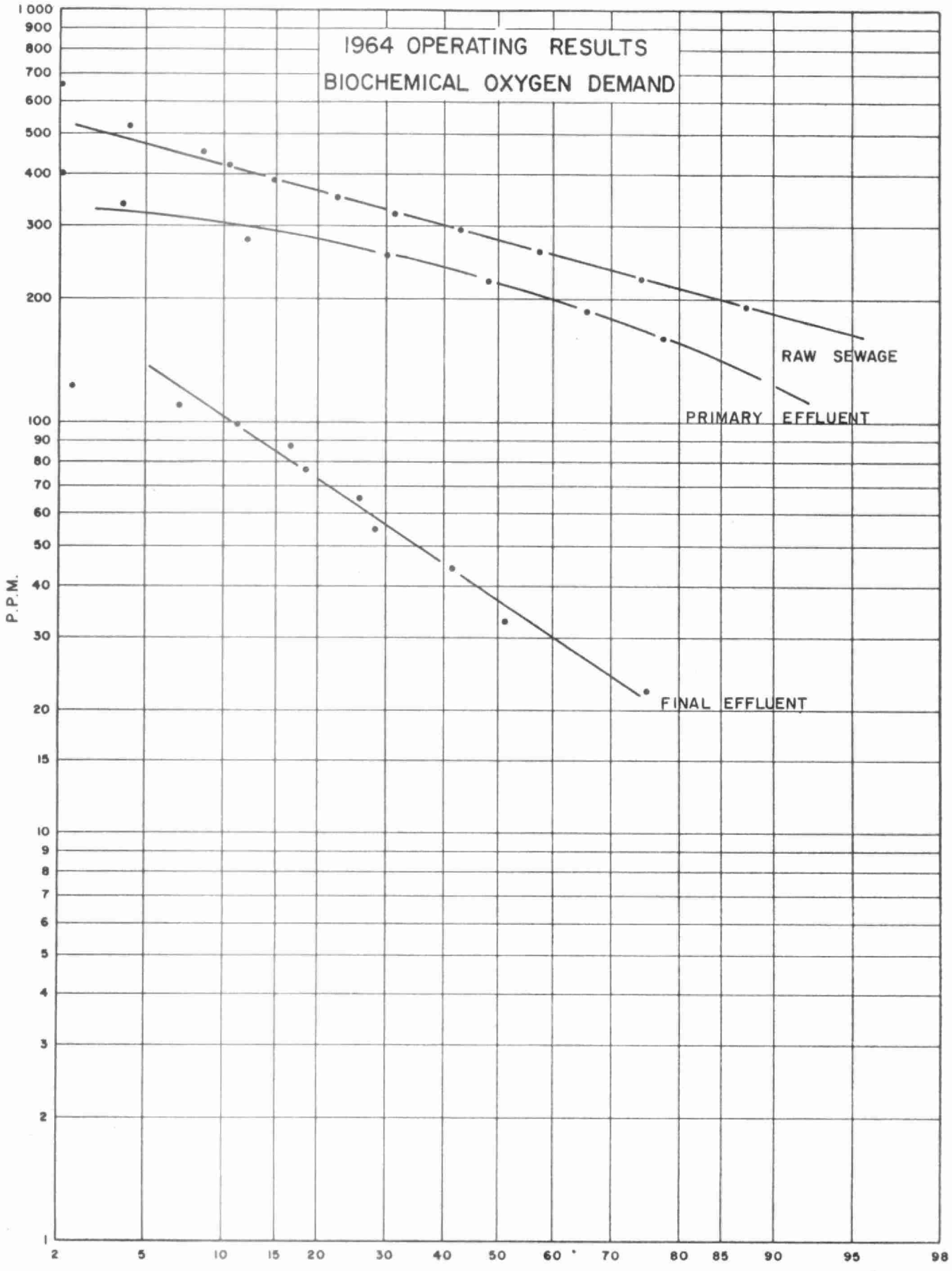
The Town of Port Credit contributed a total of 163.442 million gallons during the year which average 0.45 million gallons per day.

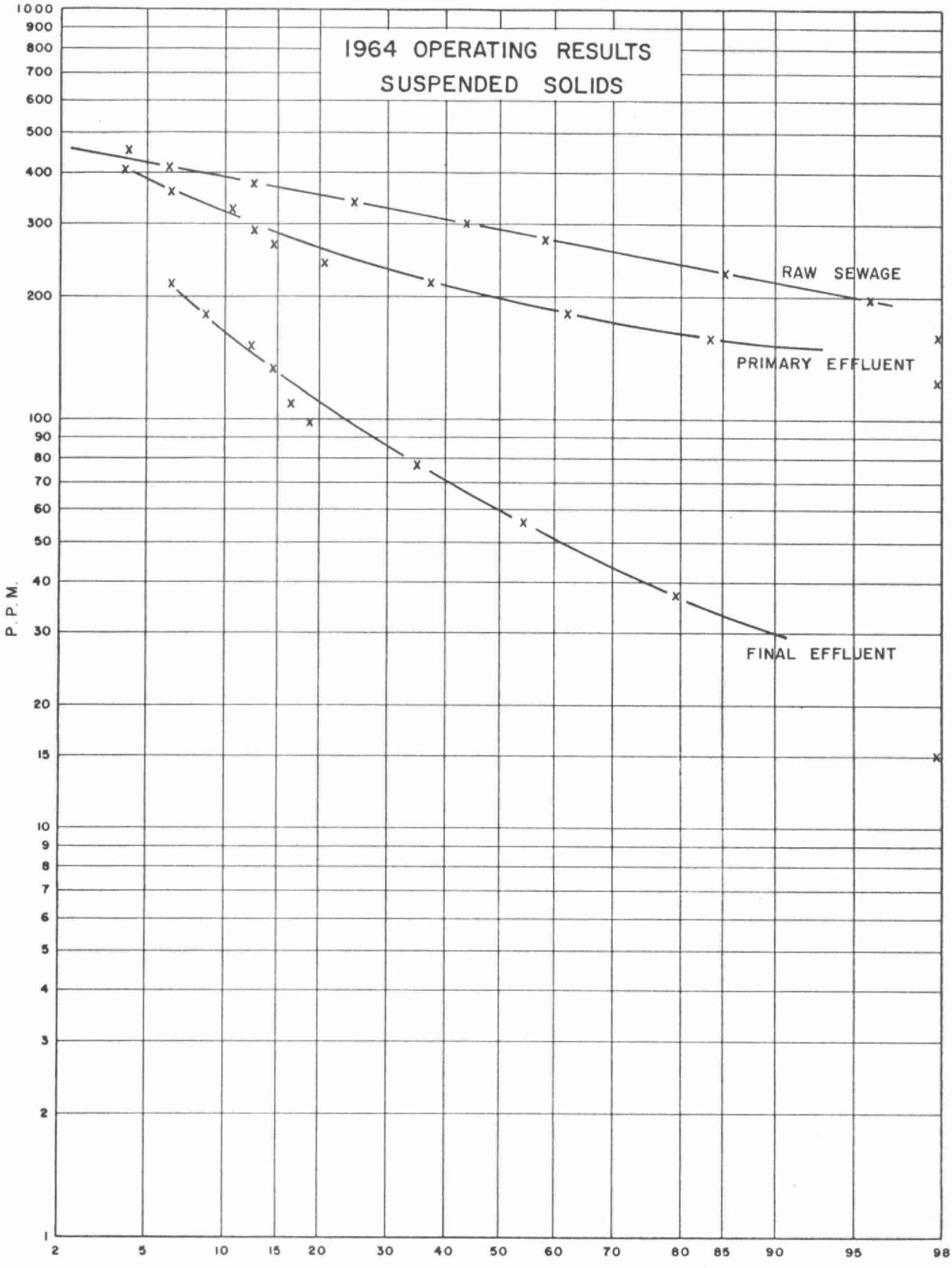
The Township of Toronto contributed a total of 835.80 million gallons during the year an average of 2.28 million gallons per day.

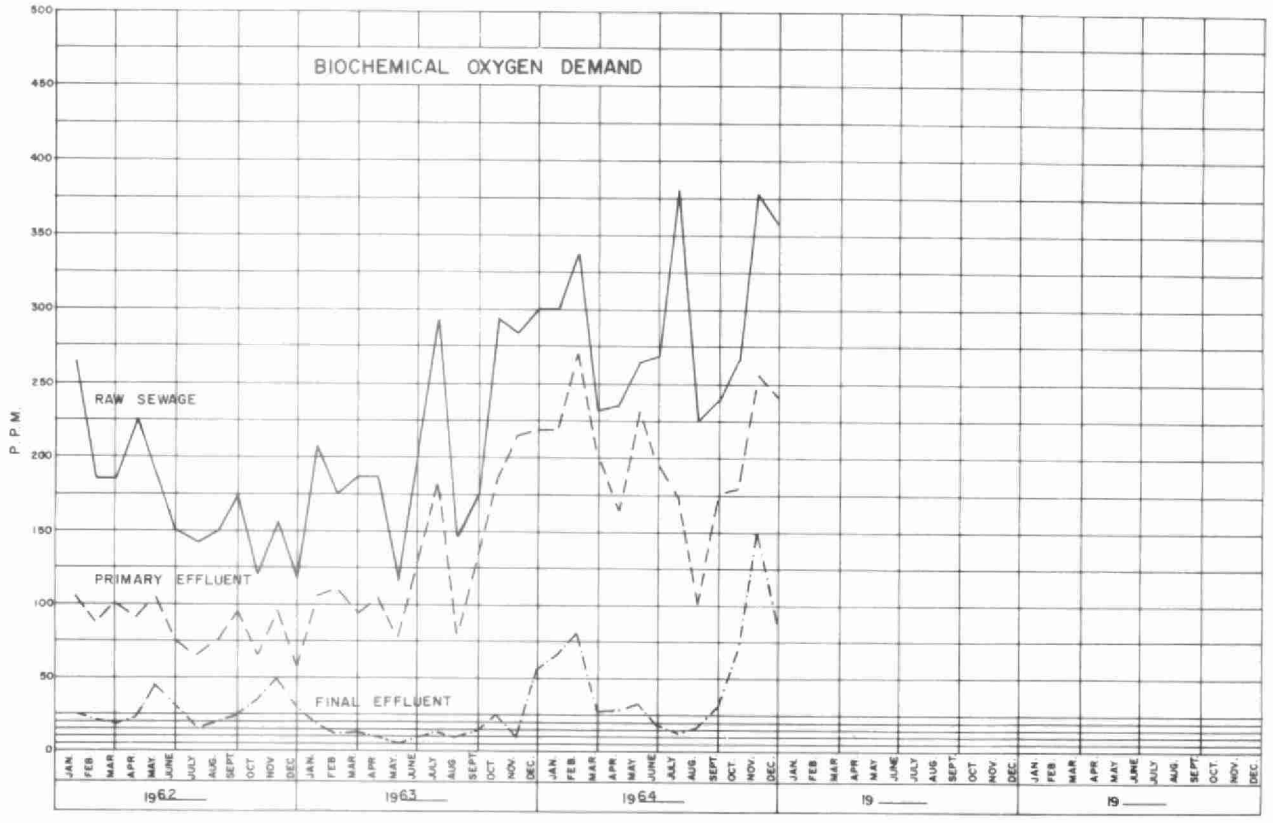
Metropolitan Toronto contributed a total of 1359.528 million gallons during the year which averaged 3.71 million gallons per day. The flow from Metropolitan increased by approximately two million gallons a day between May and August.


PROBABILITY OF FLOWS
366 SAMPLES
AVERAGE DAILY FLOW IN MILLION GALLONS
11·0
10·0
9·0
8·0
7·0
6·0
5·0
4·0
3·0
2·0
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99·8
99·9
99·99
1964
1963

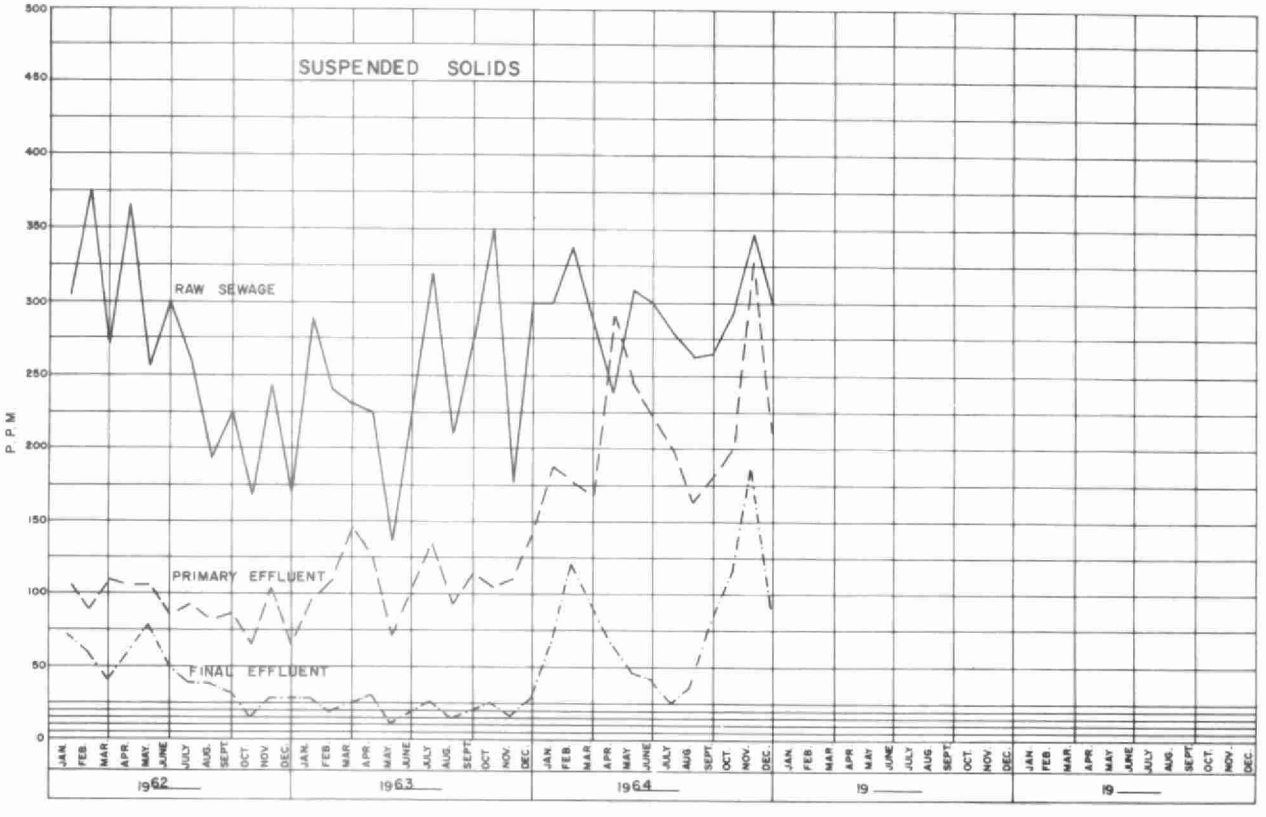

AVERAGE DAILY FLOW
M.G.D.
10·0
9·0
8·0
7·0
6·0
5·0
4·0
3·0
2·0
1·0
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19
19


1964 OPERATING RESULTS
BIOCHEMICAL OXYGEN DEMAND
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
P.P.M.
1 000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN


1964 OPERATING RESULTS
SUSPENDED SOLIDS
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
P. P. M.
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN



MONTHLY VARIATIONS

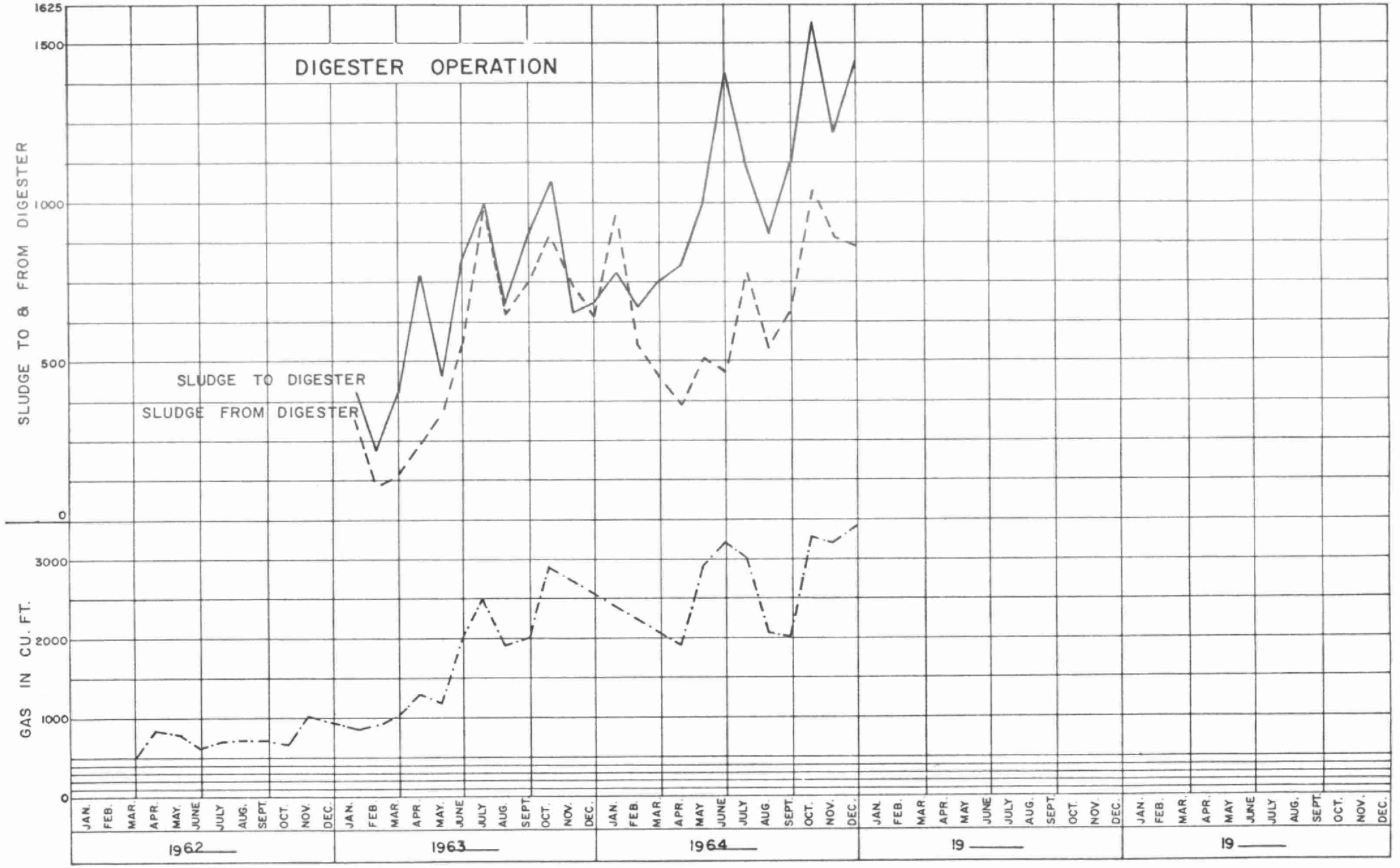


GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	302	56	81.5	153.3	249	24	90.5	140.2	3
FEB.	338	66	80.5	151.7	254	61	80	107.7	38
MAR.	234	82	65	134.5	289	117	59.5	152.2	30
APR.	236	29	87.5	180.5	239	63	73.5	153.5	46
MAY	299	28	90.5	256.9	309	44	85.5	251.2	47
JUNE	267	18	93	249.8	302	39	87	263.9	38.5
JULY	238	13	94.5	210.3	280	22	92.0	241.1	109
AUG.	168	16.2	90.5	198.4	264	32	88.0	303.2	87
SEPT.	380	30	92.0	444.9	265	77	71.0	239.0	116
OCT.	223	68	69.5	172.8	293	110	62.5	204.0	138
NOV.	378	151	60.0	251.3	348	182	47.5	183.3	104
DEC.	356	87	75.5	314.7	293	84	71.5	244.5	87
TOTAL	–	–	–	2724.4	–	–	–	2488.5	843.5
AVG.	285	54	81.0	227.0	282	71	74.5	207.4	70.3

COMMENTS

The Lakeview Water Pollution Control Plant operated well in 1964. Although Commission objectives were not met consistently due to hydraulic overload, the average tons of BOD removed was increased 145% over 1963 and SS removed was increased 87% over 1963.


DIGESTER OPERATION
SLUDGE TO & FROM DIGESTER
1625
1500
1000
500
0
SLUDGE TO DIGESTER
SLUDGE FROM DIGESTER
GAS IN CU. FT.
3000
2000
1000
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19 ____
19 ____

DIGESTER OPERATION

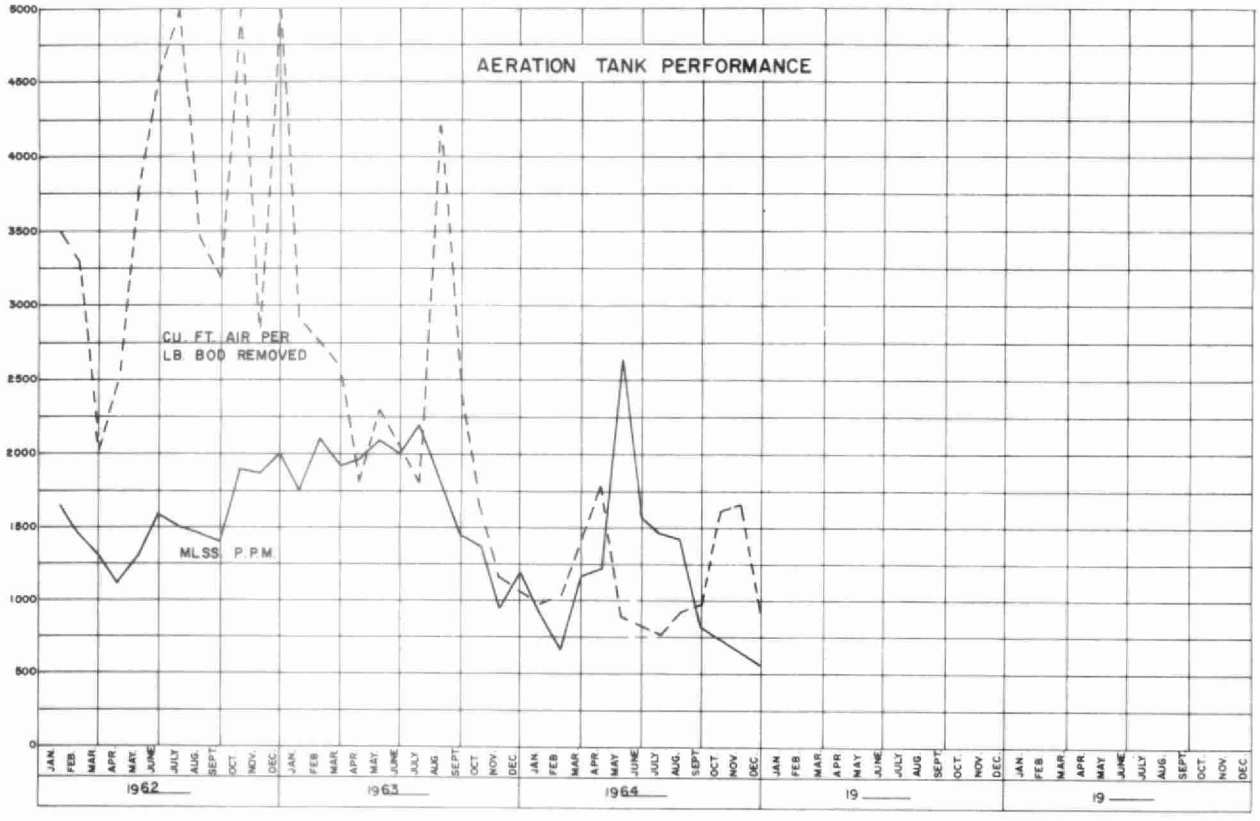
MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	
JAN.	124.50	4.65	3.75	155.01	3.21	2.48	* -
FEB.	107.38	5.62	4.51	87.82	3.41	2.29	-
MAR.	121.82	5.64	4.28	71.03	3.10	2.01	-
APR.	128.36	5.48	4.26	57.24	3.25	1.97	1869.73
MAY	161.94	4.44	3.15	80.54	3.20	2.03	2864.45
JUNE	225.73	5.26	3.79	65.00	3.56	2,14	3322.74
JULY	183.30	4.96	3.57	125.54	3.80	2.32	2951.35
AUG.	144.58	4.60	3.27	86.48	3.95	2.57	2082.11
SEPT.	182.29	5.30	3.98	105.21	-	-	1965.70
OCT.	254.33	3.83	2.73	175.19	2.80	1.68	3452.90
NOV.	196.04	4.66	3.50	142.90	-	-	3350.10
DEC.	233.32	4.12	2.88	138.96	-	-	3725.57
TOTAL	2063.59	-	-	1290.92	-	-	34112.87
AVG.	171.97	4.88	3.64	107.58	3.36	2.17	2842.74

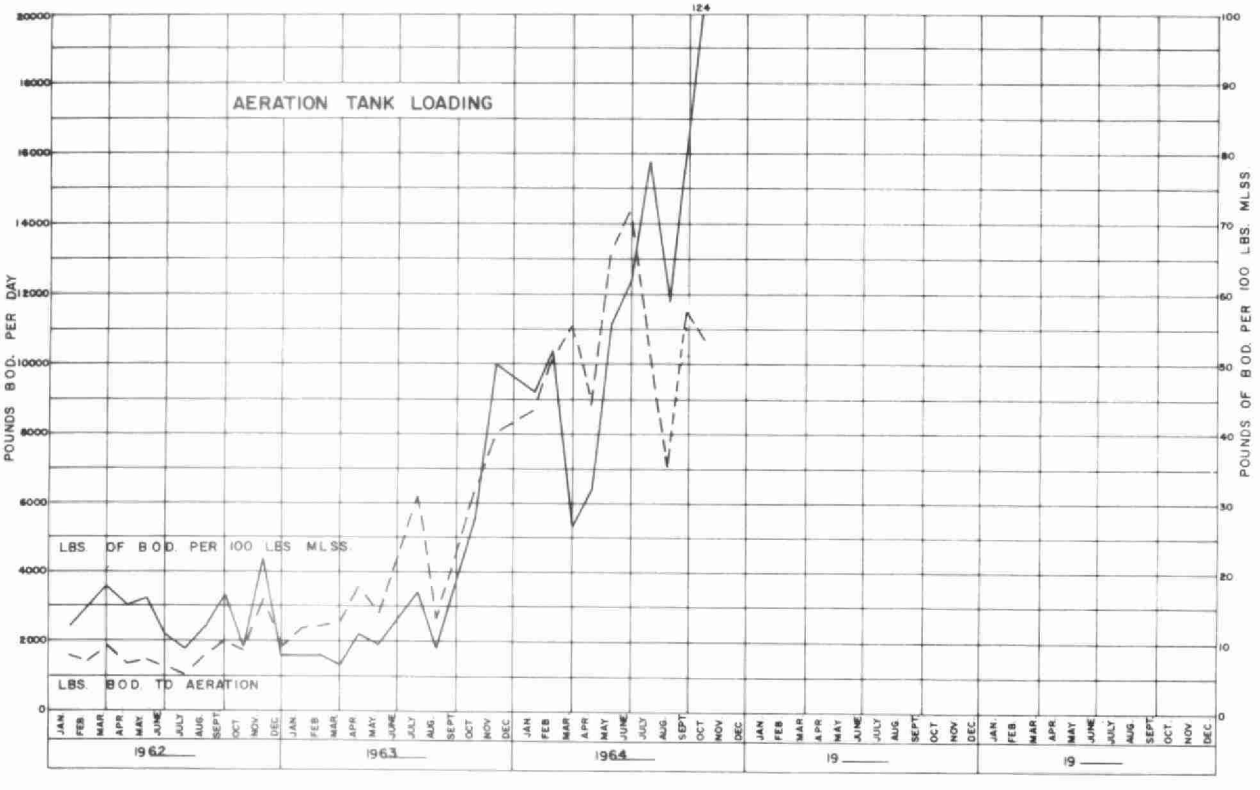
* meter under repair

COMMENTS

A total of 2,063.590 cu. ft. of raw sludge at an average solids concentration of 4.88% was pumped to the digesters and 1,290,920 cu. ft. were removed. This is a reduction in volume of 37%. There was a 40% reduction in the volatile solids content.

Gas production was 7.2 cu. ft. per pound of volatile matter added. This is considered normal gas production.


AERATION TANK PERFORMANCE
CU. FT. AIR PER LB. BOD REMOVED
M.L.S.S. P.P.M.
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19
19


AERATION TANK LOADING
POUNDS B.O.D. PER DAY
POUNDS OF B.O.D. PER 100 LBS. M.L.S.S.
LBS. OF B.O.D. PER 100 LBS. M.L.S.S.
LBS. B.O.D. TO AERATION
124
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
100
90
80
70
60
50
40
30
20
10
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1962
1963
1964
19
19

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	219	1166	46	996
FEBRUARY	268	1203	52	1039
MARCH	197	2630	26	1367
APRIL	163	1582	34	1799
MAY	232	1455	56	880
JUNE	217	1430	62	817
JULY	172	803	79	1019
AUGUST	104	743	59	1422
SEPTEMBER	177	-	-	962
OCTOBER	180	532	124	1619
NOVEMBER	256	916	95	1683
DECEMBER	241	628	130	900
TOTAL	-	-	-	-
AVERAGE	202	1190	69	1209

COMMENTS

In May 1964, there was considerable increase in flow. This is reflected in the pounds of BOD per 100 pounds of mixed liquor suspended solids. The mixed liquor SS was restricted by the available air.

Step aeration was conducted throughout most of the year.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	124.647	7040	5.65
FEBRUARY	111.573	8170	7.32
MARCH	177.030	11560	6.53
APRIL	174.390	11908	6.83
MAY	189.600	11313	5.97
JUNE	200.660	11100	5.53
JULY	186.920	10280	5.50
AUGUST	261.370	13385	5.12
SEPTEMBER	254.220	16380	6.44
OCTOBER	222.980	15040	6.74
NOVEMBER	221.420	14940	6.75
DECEMBER	233.960	16068	6.87
TOTAL	2358.770	147184	-
AVERAGE	196.564	12265	6.24

COMMENTS

During 1964 a total of 147,184 pounds of chlorine were used to provide a chlorine residual of 0.5 ppm after 15 minutes contact. The dosage required varied from 5.5 ppm to 6.9 ppm and averaged 6.2 ppm. Chlorine is purchased in lots of 14 one ton cylinders.

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